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For its antiquity perhaps the most interesting thing is the "Grotta Metrimania," in which are the remains of a temple used by the ancient worshippers of the sun. It faces east, to catch the first beams of the rising god, and is approached by a long and narrow stairway in the rocky ground near the "Arco Naturale," a natural arch formed by the action of the winds and waters upon the limestone of which the island is chiefly composed.

This grotto is not at the sea-level, but some hundreds of feet above it, though it has all the appearance of having been formed by the action of the waves. This island is said to have risen and fallen to different levels at various times, presumably by volcanic action, although it is not a volcanic island; at least, it is not a volcano, but it is so near to surrounding volcanoes that it must have been influenced by them. For instance, there is a sunken volcano under the water at the mouth of the Bay of Naples, between Capri and the island of Ischia, which last is itself an old volcano. Capri has, however, been many thousands of years at its present level, so that the waves have had time to hollow out many beautiful grottoes besides the famous blue one. The Red, the Green and the White grottoes are all well worth a visit, which can be easily made whilst on a voyage round the island in a fishing-boat, which is a very good form of picnic on a smooth sea and a bright day.

But the best of all picnics is one to the top of Monte Solaro. The journey cannot be called a climb, and is little more than a steep walk; and the reward when you get there is too delightful for words. Nearly two thousand feet above the water! And on the south side the mountain is so precipitous that the waves seem to be almost at your feet. And the view!—well, I have said so much already about the beauties of this enchanting island that I fear you will suffer from a surfeit of scenery if I say more; and after all silence is the best expression of its grandeur, as you will feel when you are there.

And now it is time my chat came to an end, for though I have not told you half there is to tell about Capri, there are limits to all things, even to chats.

EUCLID'S SIXTH BOOK.

BY P. G. O'CONNELL.

ALL who remember their childhood will agree with me that every child who is being taught anything has much to put up with. There are some who say, "So much the better: does the little beggars good!" To these I do not address myself to-day. I wish to confine myself to pointing out that the English child who is being taught Euclid has more to put up with than any other child in the world. In calculating the cost of carpets in arithmetic, he has been told to assume that the area of an oblong is its length multiplied by its breadth, and, after considering a number of examples, he has probably realized that this is a necessary fact. Soon after commencing Euclid he learns that the area of a triangle is half that of an oblong on the same base and of the same height, or, as Euclid puts it, "between the same parallels," It logically follows that the area of the triangle is half the product of the length and breadth of the oblong, but, if a child assume this, his teacher will incorrect him at once. I use the verb "to incorrect" as the opposite of the verb "to correct." When you correct a person, he is wrong, and you put him right; when you incorrect a child, he is right, and you put him wrong.

The position taken up by these incorrectors is that you may allow a child to assume the area of an oblong to be the product of its length and breadth in arithmetic, but not in Euclid, because (they say) arithmetic deals only with commensurable quantities, while Euclid deals also with incommensurable quantities. This position would be untenable, even if it were possible for the human mind to discover a proof applicable to incommensurable quantities, for then the logical course would be to introduce this proof as an extension of the arithmetical proof, which is admittedly valid for commensurable quantities; but, when we consider that an absolute proof, applicable to incommensurable quantities, is beyond the comprehension of the human mind, we must pronounce the position of the incorrectors to be not merely untenable, but even absurd.

It is to be supposed that these incorrectors imagine Euclid's proof of VI. 1. to be applicable to incommensurable quantities though the very word “incommensurable” should show them their mistake. How can it be possible for the human mind to prove the equality of two quantities if the human mind is incapable of finding the exact value of either? We can prove, it is true, that the difference between the two quantities is less than “any assignable magnitude,” and therefore inconceivable by the human mind; and, when we do this, we *say* that the quantities are equal. This convention is mentioned by Euclid in the fifth definition of his fifth book—at least, the definition appears to have been thus understood by such mathematicians as Leibnitz, Todhunter, and others, but another very justly celebrated mathematician, Casey, takes a different view. In his edition of Euclid he has altered the wording of the definition in such a way that, instead of being a definition of the conditions under which two possibly incommensurable ratios are *said* to be equal, it is a statement that, under these conditions, they *are* equal. He then proves by algebra that, under the given conditions, the difference between the ratios is “less than any assignable magnitude,” and concludes that “the difference is nothing, therefore” the ratios are equal. Casey does not even pretend to have translated the Greek text accurately; indeed, he confesses he has “altered” the wording; nevertheless, he calls his rendering—“Euclid's Theorem.” As Casey's work is particularly brilliant in other respects, his book has gone into several editions, so that many hundreds of children must have been taught to believe that there is no difference between absolute equality and merely conventional equality—a belief which they will have to unlearn painfully when they begin the differential. It is true that very few of these children will ever reach the differential, but it ought not to be true. It is the fault of their teachers that it is true, and no teacher can be sure that any pupil of his will never attack the differential.

Some may say that, since the conception of absolute equality is impossible to the human mind, the conventional equality of which I have spoken is the true meaning of the word “equality.” I can best answer this argument by employing a simile. Let us suppose that we are watching the flight of two birds, which are unequal in size. As they recede they seem to become gradually smaller, until the impressions they make upon our physical eyes become indistinguishable in size. Shall we therefore say that these impressions are equal? If we said so, would not a first-class telescope lead us to suppose that we were wrong? Similarly, when, with our mental eyes, we view two unequal quantities vanishing, we do not say that when they vanish they are equal, though their difference is less than “any assignable magnitude.” On the contrary, we believe that a mental microscope would show them to be unequal, and we even reason about their probable ratio at the moment of vanishing.

There may be some who, after reading the above, will still prefer to pin their faith to the brilliant and celebrated Casey rather than to the unknown disciple of Todhunter. To them it must be an appalling thought that hundreds of British children are being made to learn by heart a definition which Casey considers “misleading.”

Is it in any case likely that the average child will gain anything by learning a definition capable of being misunderstood by at least one brilliant mathematician? Would it not be wise to defer the study of it until the conventional equalities and inequalities of the differential have been considered? It will be as interesting then as it is confusing now. Meanwhile, is it necessary that we should continue to sacrifice geometry to the shade of Euclid, and to turn out pupils with so little geometrical knowledge that they have to learn formulae for the volumes of spheres and cones, like unintelligent parrots? The average child has little difficulty in realizing that the area of any triangle is half the product of its base and altitude, and that therefore the areas of triangles having equal altitudes are to one another as their bases, and the areas of triangles having equal bases as their altitudes, and this proof is as nearly applicable to incommensurable quantities as is Euclid's.

The rest of the propositions in the book might be classed as easy riders, were it not for the phraseology with which they are encumbered. Let us introduce the facts first and the phraseology afterwards. Let any two points, D and F, be taken in the sides A B and B C of any triangle, or in those sides produced. Suppose, for example, that B D is one-third of B A, and that B F is two-fifths of B C. Join D F, F A. Then the triangle D B F is one-third of A B F, and A B F two-fifths of A B C. Therefore D B F is one-third of two-fifths of A B C. Now, if any two triangles have one angle of the one equal to one angle of the other, they may be placed with those angles coinciding, as in the case of the triangles A B C, D B F, and it is easy to see that the ratio of their areas may be found in the same way, that is, by multiplying together the ratios of the sides. The fact is easily assimilated, and, when the fact has been assimilated, it is not hard to remember the words in which Euclid clothes it. When the ratios (B D to B A and B F to B C) are equal, D B F is to A B F as A B F is to A B C. Under these circumstances the triangles are said to be in continued proportion, and D B F is said to have to A B C the duplicate ratio of that which it has to A B F, that is, of D B to A B, or B F to B C; but these are mere matters of phraseology, having only an arbitrary connection with geometrical truth. If D C be joined, the ratios B D to B A and B F to B C still being supposed equal, the areas of A B F and D B C are equal, since each bears the same ratio to the area of A B C. This is an important geometrical truth, but it is only by convention that such triangles are said to have the sides about their equal angles reciprocally proportional. What we have seen to be true of triangles must also be true of the parallelograms, which are the doubles of those triangles, and therefore of rectangles (oblongs). Consideration of the same figure will render many other truths easy of assimilation, as, for instance, that, under the given circumstances, D F must be parallel to A C, and the triangles D B F, A B C, equiangular to each other. It is interesting to note that this one figure will prove nearly every proposition in the book, and also its converse.

There is no doubt that the average child is capable of enjoying geometry. It is a fact that the average boy hates Euclid. How long shall we in England continue to sacrifice understanding to phraseology and geometry to Euclid's pretty little definitions—"A point is that which is not anything," "A line is that which is not anything, except in one direction"—and so on? There is a notion abroad that teachers are at the mercy of examiners in this matter. It is a fallacy. Even in preparing pupils for an examination in which no riders are set—and importance is attached rather to the letter than to the spirit of Euclid's proofs—it is good policy, as well as sound common sense, to introduce geometry first, and her old world-servant Euclid afterwards.

"OURSELVES, OUR SOULS, AND BODIES."

Book of Common Prayer.

"Self-reverence, self-knowledge, self-control."—*Tennyson.*

THE whole question of self-management and self perception implies a dual self. There is a self who reverences and a self who is reverenced, a self who knows and a self who is known, a self who controls and a self who is controlled. This, of a dual self, is perhaps our most intimate and our least-acknowledged consciousness. We are a little afraid of metaphysics, and are still more afraid of self-consciousness, and we do not take the trouble to analyse our fears.

It is well that we should fear to wander into regions of mind which we have no plummet to fathom, and from which we are incompetent to bring back any good thing. It is well, too, that we should dread that form of self-consciousness which makes us sensitively, or timorously, or proudly aware of our individual peculiarities. But, for fear of Scylla and Charybdis, we have avoided unduly a channel which leads to a haven where we would be.

Our business here is not to attempt any psychological explanation of the fact of the two selves of which each of us is aware; but, rather, to get some clear notions about that, let us call it, *objective* self, the conduct of which is the chief business of that other troublesome *subjective* self, of which we are all too much and too unpleasantly aware.

One of the miseries of thoughtful children and young people arises from their sense of the worthlessness of this poor, pushing, all too prominent self. They are aware that they are cross and clumsy, rude and "horrid." Nobody *can* like them. If even their mother does so, it must be because she does not quite see how disagreeable they are. Vanity, the laying of oneself out for the approbation of others, is very possible, even to children of generous temper. But I doubt if conceit is possible to any but the more commonplace minds, content to shape their opinions, even of themselves, upon what they suppose to be the opinions of those around them.